Operation and Service Manual

Wood-Fired Central Heating Boiler

FHG

Tested & Listed By O-TL c US Portland Oregon USA
OMNI-Test Laboratories, Inc.
Report #236-O-06-2

TÜV AUSTRIA

A French language manual may be obtained from Tarm Biomass by calling 800-782-9927 or by email request to: info@tarmusa.com.

Read and follow the operating instructions and safety information! Subject to technical change!

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Update Date: May 2014
Reprint date: Nov 2014

Dear customer!

Congratulations on choosing a quality product from FROLING.

The Froling FHG Boiler features a state-of-the-art design.

Please read and observe the operating instructions and always keep them close to the boiler for reference. They contain safety information and all the operation and maintenance specifications needed to operate the boiler safely, properly and economically.

The constant further development of our products means that there may be minor differences from the pictures and content. If you discover any errors, please let us know.

Subject to technical change.

The FHG boiler is produced using the highest quality materials and a modern production system. The use of high technology laser cutting and robotic welding system, accompanied by time honored European design, craftsmanship and attention to detail, results in a long lasting boiler with unmatched fit and finish.

With proper installation, operation and maintenance your FHG log wood boiler will provide years of safe, dependable, economic and earth friendly heating.

This manual contains paragraphs that require your special attention. These paragraphs are marked with the safety information according to ANSI Z535 described in chapter 2.

Units of Measurement

Most hardware and fittings on the boiler are metric (some plumbing fittings are British Straight Thread). In this manual the convention used for dimensions is that values are presented in English units, followed by metric units in parenthesis, for example: 6” (152 mm).

In this manual temperatures are presented as degrees Centigrade.

Note: A conversion table between Centigrade and Fahrenheit is provided in chapter 4.3 Setting parameters.

Installation and Warranty Requirements

This product is provided with a limited warranty which is described in chapter 7.1 Warranty conditions within this manual. The warranty is contingent upon the successful and legal installation of the boiler. At a minimum, the installation, adjustment, start up, service, and maintenance of this product must be performed by a licensed professional heating system installer. Where applicable, the installation must be inspected and accepted by the legally responsible entity. Conditions described in the text of the warranty for keeping it in force must be followed by the owner/ system operator.

If the boiler has been purchased through a dealer, the warranty claim must be made to the dealer. Otherwise, claims may be made directly to Tarm Biomass.

Please read the literature enclosed by the manufacturer regarding the various accessory devices. These devices are warranted by the manufacturer, NOT BY Tarm Biomass. These accessory devices must be installed and used according to the recommendations of the manufacturer.

Failure to follow these instructions could result in property damage, bodily injury, or death. All boilers must be installed in accordance with national, state, and local plumbing, heating, and electrical codes and the regulations of the serving electric, water, and gas utilities. Contact local building or fire officials before installation about restrictions and installation inspection requirements in your area. This boiler is safety tested and listed. The FHG boiler does not carry an ASME stamp.

The instructions in this manual and in supporting documentation (additional instructions, diagrams, and component information provided by Tarm Biomass) must be followed. If the instructions are in conflict with local code requirements, the local code requirements will prevail. When in doubt, contact your dealer or Tarm Biomass. The manual and supporting documentation must be retained by the owner/ system operator for reference and future use.

The installer is responsible for familiarizing the owner/ system operator with all aspects of boiler operations, safety procedures, monitoring and cleaning requirements, shut down procedures, and annual maintenance requirements.

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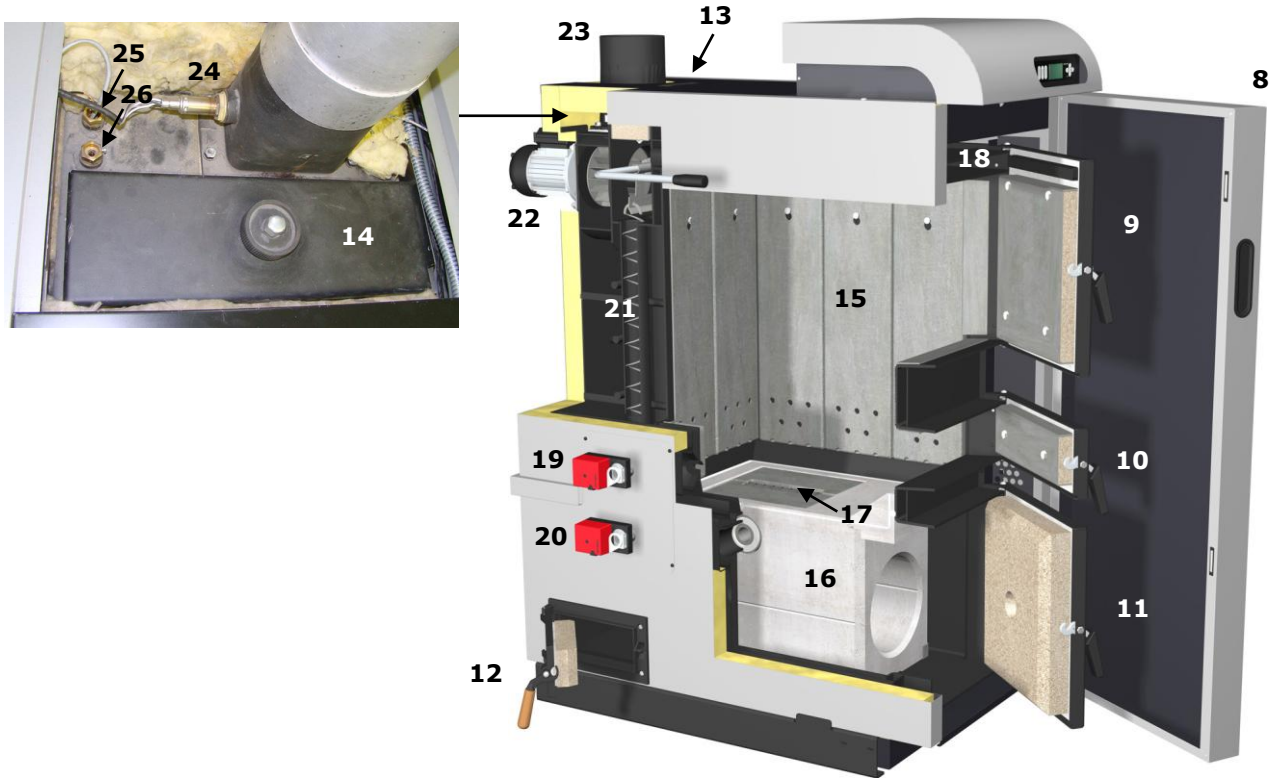
1 Product overview

Pos.	Component
1	FHG Wood-Fired Central Heating Boiler
2	Boiler Control System Lambdatronic S3200
3	Ash-Pit Cover
4	Lever for Heat Exchanger Cleaning System
5	Main Switch (Located on side box)
6	Overheat Thermostat (Safety Temperature Limit Switch - STL)
7	Control Panel of Boiler Control System Lambdatronic S 3200
7.1	Large graphical display to show operating modes, states of components and parameters
7.2	Status LED (operating status): - green light flashing slowly: boiler activated - green light flashing quickly: boiler deactivated - red light flashing: error
Navigation keys for navigation within the menus and to set parameter values:	
7.3	UP arrow
7.4	DOWN arrow
7.5	Enter key
7.6	Back key
7.7	Function keys for selection of individual boiler functions or heating modes directly



Pos.	Component
8	Insulation Door
9	Fuel Loading Chamber Door
10	Ignition Door
11	Combustion Chamber Door
12	Ash-Pit Door
13	Heat Exchanger Insulation Cover
14	Heat Exchanger Cover
15	Fuel Loading Chamber
16	Combustion Chamber
17	Flame Slot
18	Smoke Extraction Duct
19	Primary Air Damper Actuator
20	Secondary Air Damper Actuator
21	Heat Exchanger
22	Induced Draft Fan (ID Fan)
23	Flue Gas Connector
24	Lambda Probe
25	Boiler Sensor and Sensor of Overheat Thermostat (position 6)
26	Overheat aquastat well

1.1 Boiler Fabrication and Testing

Your boiler was manufactured by Froling, a world leader in hot water (hydronic) heating for over 40 years. The FHG Series boiler conforms to traditional high standards for quality and reliability. It offers modern wood gasification technology with high operating efficiencies at over 90%. If treated properly and operated according to the guidelines in this manual it will provide years of safe, dependable, and economical heating.

FHG boilers are designed and built in accordance with European Standard EN 303-5. Safety and performance testing and listing for North American markets have been performed by OMNI Test Laboratories, Inc., Portland, Oregon. The boiler is tested and listed to applicable UL, CAN and other standards. The boiler is not ASME stamped. The installer should follow local or state installation requirements.

The FHG wood gasification boiler is a log wood fired boiler designed and constructed for highly efficient combustion of log wood.
Do not burn other fuels in the FHG boiler. The FHG is not a self contained weather-tight boiler. It should be installed within the heated building. FHG log wood boilers must be installed with a thermal storage system capable of absorbing the complete output of the boiler during periods when the building is not calling for heat.

1.2 Models and Applications

Four FHG models are available (20, 30, 40 and 50) covering an output range between 68,000Btu/hr and 170,000Btu/hr. Specification data for each FHG is provided in the Installation Manual.

The boilers can be utilized as a single heat source, or in parallel with another boiler.

2 Safety

This manual contains paragraphs that require your special attention. These paragraphs are marked with the symbols described below:

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE NOTICE is used to address practices not related to personal injury.

2.1 Safety information

DANGER

Inappropriate use will cause faulty operation of the boiler. The instructions and information provided in this manual shall be observed.

Detailed information is given in individual instructions for operation, maintenance and cleaning, as well as troubleshooting. Any further work shall be carried out by authorized dealer.

WARNING

Faulty operation conditions (e.g. insufficient combustion air, non-permitted fuels) will cause serious faults in combustion (e.g. spontaneous combustion of carbonization gases or flash fires)!

Instructions and guidelines for system configuration and minimum operation data values, as well as regulations, standards and codes for safe and lawful operation together with other heating components as given in the manuals must be observed!

WARNING

Inadequate design, installation and maintenance of the flue gas system will cause insufficient chimney draft and serious faults in combustion (e.g. spontaneous combustion of wood gases or flash fires)!

Keep flue system tight and cleaned according to the owner's manual

2.1.1 Installation Hazards

Install, modify and use only in accordance with manufacturer's manuals. Refer to authorities having jurisdiction for proper installation. Contact local building and fire officials about restrictions and installation inspection in your area. If there are no applicable local codes, follow ANSI/NFPA 211 and CAN/CSA B365. Special precautions are required for passing the Chimney through a combustible wall or ceiling.

Inspect and clean exhaust system, Fuel Loading Chamber, Combustion Chamber, Ash-Pits, and Heat Exchanger frequently in accordance with owner's manual.

DANGER!

⚠ Working on electrical components may cause severe injuries from electric shocks!

WARNING!

⚠ The electrical system of the boiler shall be supplied from a double 115 V 60 Hz (nominal 230 V AC) 15 amp branch circuit including neutral and ground connection. For wiring instructions please refer to Installation Manual!

⚠ Chimney must be 6'' (150 mm) diameter listed UL-103 HT or ULC-S629 residential all-fuel type or tile-lined masonry. Flue connector pipe must be 6'' (150 mm) diameter made of a minimum 24 MSG black steel.

⚠ Inadequate design, installation and maintenance of the flue gas system will lead to insufficient chimney draft and could result in Danger of Life or Severe Injury caused by serious faults in combustion, e.g. explosively combustion of wood gases and flash fires!

⚠ This boiler requires fresh air for safe operation and must be installed so there are provision for adequate combustion and ventilation air!

CAUTION!

⚠ Do not connect this unit to a Chimney flue serving another appliance!

⚠ Flooring must be a minimum 3/8'' (10 mm) non-combustible material covering the installation clearance area! The floor must be level and reinforced if required. For construction of the floor beneath the boiler please pay attention to weight of boiler, water content and wood fuel according to the Installation Manual!

⚠ This boiler is not for use with an automatic stoker

⚠ Connect to an existing boiler system in combination with heat storage only!

⚠ Use original spare parts only. Installation of non-licensed replacement parts will void the warranty!

2.1.2 Operation Hazards

NOTICE!

Burn Wood only, max. length 20'' (50cm)!

Load fuel carefully or damage will result!

Build the wood fire directly on the boiler Fuel Loading Chamber refractory floor!

Do not use small pieces or wood waste that could fall through the Flame Slot in the refractory.

DANGER!

Risk of Fire or Explosion!

- Do not burn coal, fuel coke, garbage and other residual material, painted or treated wood, gasoline, diesel, fuel oil, naphtha, engine oil, drain oil or other flammable liquids or any other organic materials or other inappropriate materials!
- Do not use chemicals, gasoline, oil or any other combustible fluids to start the fire!
- Use of inappropriate fuels can result in Danger of Life or Severe Injury caused by explosive combustion and flash fires!
- Burn fuels other than those designated in the manual will void warranty

DANGER!

Explosive Gases!

- Never open Combustion Chamber Door, Ash-Pit Door, Ash-Pit Cover or Heat Exchanger Cover during operation or refueling!
- Faulty operation of boiler system will cause Danger of Life or Severe Injury and Property damage!
- Flue gases can cause fatal poisoning! In case of strong smell of flue gas:
  1. For safety keep all Boiler Doors and Ash-Pit Doors tightly closed!
  2. Ventilate the room where boiler is installed!
  3. Close the door of the boiler room and doors to living areas!

WARNING!

Risk of Fire!

- For safety keep all Boiler Doors and Ash-Pit Doors and all Covers tightly closed during operation!
- Do not operate with flue draft exceeding 0.10 inches in water column (25 Pa), if no Draft Regulator is installed!
- Do not store fuel, clothing, furniture or other combustible material within marked installation clearances within boiler is installed!
- Faulty operating conditions not complying with Owner's Manual, such as insufficient combustion air, incorrect or insufficient cleaning and maintenance or non-permitted fuel could result in Danger of Life or Severe Injury caused by serious faults in combustion (e.g. spontaneous combustion of wood gases or flash fires)!
- Inspect and clean Boiler, Flue Gas Pipe and Chimney regularly!
- The Heat Exchanger, Induced Draft Fan, Flue Gas Pipe, and Chimney must be cleaned regularly to remove accumulated creosote and ash. Ensure that the Heat Exchanger, Flue Gas Pipe, and Chimney are cleaned at the end of heating season to minimize corrosion during the summer months.
- First firing during start-up of boiler system shall be carried out in accordance to Instruction Label at Fuel Loading Chamber Door and in attendance of an authorized installer or manufacturer's representative only! Disregarding of warning may cause damage or explosion of Combustion Chamber and severe injuries unfavorably!
- Gas created during solid-fuel combustion may cause a small flash when the boiler is refueled if not properly vented!

CAUTION!

Hot Surfaces!

- Hot parts and the Flue Gas Pipe can cause serious burns!
- Unauthorized access to the boiler room could result in personal injury and damage to property!
- Keep children away!
- Always use protective gloves while loading boiler or carry out other work on boiler!
- Always use Control Handles when opening Boiler Doors!
- Do not touch Flue Gas Pipe during operation!
- Do not carry out maintenance when the boiler is hot!
- Do not touch hot surfaces behind Insulation Door!

2.2 Permitted Uses

The boiler should only be operated when it is in full working order. It should be operated in accordance with the instructions, observing safety precautions, and you should ensure you are aware of the potential hazards. Ensure that any faults, which might impair safety, are rectified immediately.

The FHG is intended exclusively for heating up hydronic heating systems or hydro-air systems. Use only the fuels specified below.

The manufacturer or supplier is not liable for any property damages resulting from non-permitted uses.

2.2.1 Permitted fuel

☞ Burn Wood only, max. length 20'' (50 cm)

Chemically treated or painted wood is unsuitable as fuel. The FHG boiler is designed for burning of cord wood only. Wood briquettes or manufactured pure wood logs can also be used as fuel provided they have a minimum cross section of 2.5 sq in (16 cm²). Manufactured logs should be at least 12" (0.25 m) in length. The Fuel Loading Chamber can be filled to the top. Excessively small and compact pieces of wood or wood pellets are not suitable. Coal cannot be used as it destroys the combustion chamber!

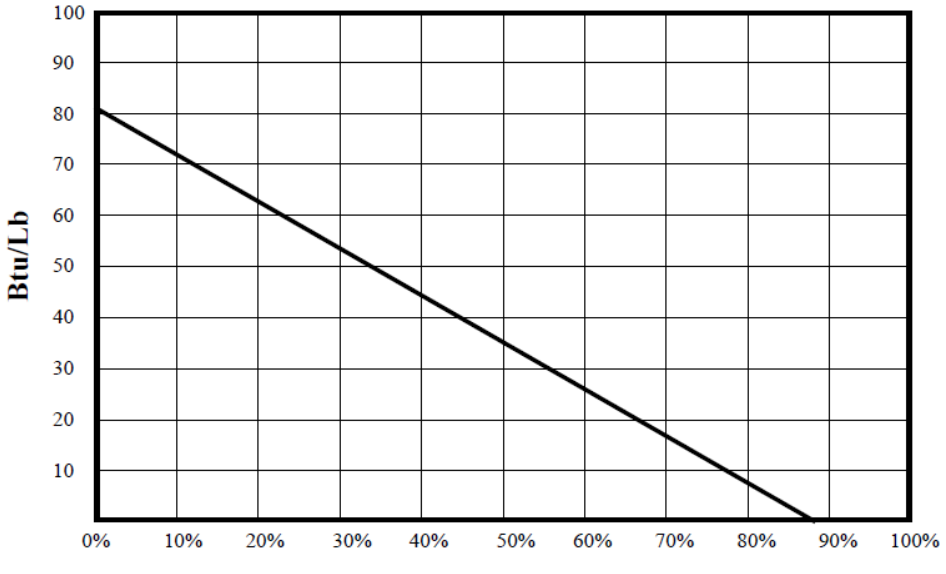


Fig 2.2
This chart shows how many Btu's are lost by burning fuel with higher moisture content. We recommend fuel with a moisture content of 20% or less.

The FHG is made to burn natural forest wood. Both hardwood and softwood are suitable, but oak should not be burned as the only source of wood for long periods because of its high acid content.

For effective gasification, the wood must be dry, i.e. moisture content 15-25%. In addition to increasing the likelihood of generating creosote in the boiler, burning wet wood uses a substantial amount of the wood energy to evaporate the water present in the wood, reducing the available energy for heat (Fig 2.2).

The wood will dry out most quickly if it is cut into the appropriate length and split into pieces 4”-5” (10-12cm) thick. The best length is 20” (0.5 m) for the FHG. The wood is best stored in the open air under cover. Wood will dry most quickly if it is carefully stacked alternatively length-wise and crosswise so that air can penetrate into the stack. Ideally the wood should be stored for at least one and a half years (two summer seasons). Do not burn small pieces of wood or wood chips in the boiler as they can block the combustion slot. Also, it can be difficult to control the combustion process effectively with small wood pieces and chips.

2.2.2 Non-permitted fuels

⚠ WARNING

Using non-permitted fuels will cause serious faults in combustion (e.g. spontaneous combustion of wood gases or flash fires).

- ❒ Do not burn: coal, fuel coke, garbage or other residual material, gasoline, diesel, fuel oil, naphtha, engine oil or other organic materials and any other inappropriate materials!
- ❒ Do not use chemicals or fluids to start the fire!

2.2.3 Who may operate the boiler

⚠ CAUTION

Non-permitted use of the boiler by unauthorized persons can cause faults in combustion. The operator is responsible to explain all cautions before allowing any person’s access to boiler room.

Unauthorized persons, especially children, are to be kept away from the boiler.

Only trained operators are permitted to operate the boiler!

Successful operation of this boiler will require daily involvement by the owner/system operator.

Biomass boilers operate differently from fossil fuel boilers, requiring more oversight and a diligent cleaning regimen.

• The owner/system operator is responsible for correct operation of the boiler per guidelines in this manual.

• Incorrect operation can reduce the boiler life.

Throughout this manual, safety considerations are noted and discussed. A few general safety considerations to be considered are:

• Safety faults or deficiencies with the boiler or installation must be rectified as quickly as possible. Either by the owner/system operator or the installer.

• Outlet pipes, ventilation channels, fresh air openings, etc. must not be closed or blocked.

2.3 Design information

It is unlawful to carry out modifications to the boiler or to change or deactivate safety equipment.

In addition to the operating instructions and the applicable national and local codes and regulations for installation and operation of the boiler system, all fire, police, and electrical regulations must be observed.

2.3.1 Approvals and reporting obligations

☞ IMPORTANT: Install, modify and use only in accordance with manufacturer's installation & operation manuals. Refer to authorities having jurisdiction for proper installation. Contact local building and fire officials about restrictions and installation inspection in your area. If there are no applicable local codes, follow ANSI/NFPA 211 and CAN/CSA B365. Special precautions are required for passing the Chimney through a combustible wall or ceiling.
Inspect and clean exhaust system frequently in accordance with Owner's Manual.

2.3.2 Requirements for initial filling and re-filling of heating system

Water quality conditions for initial filling the heating system:

For first filling of heating system water must be clean, pure or purified, odorless and without suspended matter.

For re-filling of small amounts water shall be clean at least.

⚠ CAUTION

For swimming pools or spas do not use heating water directly. Proper sized heat exchangers are required! Boiler water is not potable!

Use of a suitable antifreeze mix is allowed, but will cause a loss in heat transfer efficiency.

2.3.3 Ventilation of boiler room

During the installation of your boiler provision was made by the installer to provide a source of combustion air for the boiler. Maintaining this combustion air source is critical for proper operation of your boiler, do not close off, block or otherwise obstruct the combustion air source for your boiler. If you have questions regarding the combustion air source please contact your installer.

In addition to local codes and regulations a minimum cross section of combustion air and exhaust air shall be 28 sq.in. (180 cm²) each. Mind open cross section if gratings or fins are used!

☞ IMPORTANT for Canada: In accordance to ANSI/NFPA outside air requirements of 1 sq. inch per 1,000Btu/hr.

2.3.4 Installing the heating system

The entire heating system has to be designed according relevant national and local codes. The nominal power of the Central Heating Boiler shall be corresponding to the calculated heat demand for all heating appliances connected to the heating system both in summer and winter time.

The heating system must be able to carry all heat produced by the Central Heating Boiler and additional heat source, if applicable. The whole heating system as well as all heating zones has to be hydraulically balanced.

Special arrangements have to be provided for initial filling or re-filling and bleeding of all heating zones. Flow-check valves and zone-valves have to be installed for proper adjustment of water flow rates. All piping must be water and air tight and insulated safely.

If there is a risk of freezing for parts of the heating system all water within these heating zones has to be frost-proof!

Minimum Return water temperature

If the return water temperature is below the minimum, a part of the heated water output flow shall be mixed in.

NOTICE

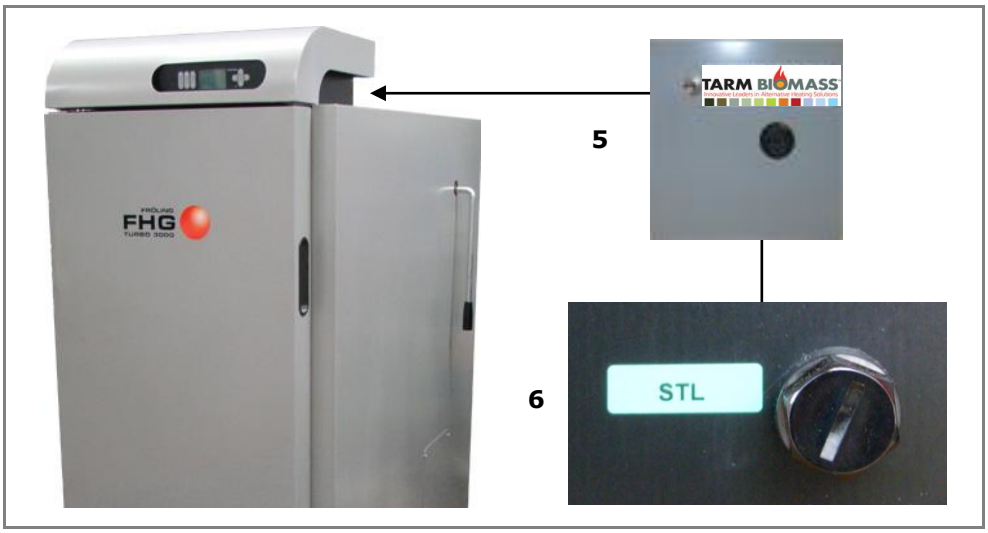
Installing the boiler without a proper valve or loading unit providing a minimum return water temperature (e.g. Termovar loading valve) can cause condensation water and fuel residue to combine to form an aggressive condensate, leading to damage to the boiler!

☞ Minimum return water temperature is 142°F (61°C)

Combination with Thermal Storage System

Your FHG boiler has been installed with a Thermal Storage System, this system may require periodic maintenance. Please review the periodic maintenance requirements of your thermal storage system with your installer.

2.4 Safety devices



5	Main switch	For shutting down the entire system ➥ All components are switched off and powered down
6	Overheat Thermostat (Safety Temperature Limit Switch – STL)	☞ See below

2.4.1 Devices for Preventing the Boiler from overheating

The FHG comes with safety systems to prevent the following:

- Pressure in the boiler exceeding 30 psi (over pressure)
- Boiler water temperature exceeding 212ºF (100º C)

Pressure Relief Valve

Protection against over-heating/ excessive pressure:

When the system pressure reaches a maximum of 30 psi (2 bar), the Pressure Relief Valve opens and the heating water is released in the form of steam.

Overheat Thermostat (Safety Temperature Limit Switch – STL)

The Overheat Thermostat stops combustion at a boiler temperature of 212°F (100°C). The circulators continue to run!

In case Overheat Thermostat automatically has been activated:

- ❒ Wait for boiler temperature to drop below 170°F (77°C)
- ❒ Remove cap of Overheat Thermostat (STL) by screwing-off counter-clockwise. STL located at right hand side of Boiler Control System viewed from front side of the boiler.
- ❒ Release STL by pushing button behind cap using a small screw driver or ball point pen. Release is successful, when fault is gone on display.
- ❒ Screw-on cap of STL again (clockwise).

On the Boiler Control System there is an Overheat Thermostat. If the boiler exceeds 212°F (100°C) it will shut off the Induced Draft Fan.

Gravity Over-heat Dump Loop

A gravity over-heat dump loop is required for solid fuel boiler to dissipate heat during power outages. In the event of a power failure, this loop should provide dissipation for at least 10% of the boiler's maximum rated output. Usually this heating zone is connected to the heating system by a solenoid valve, normally closed. In case of electrical power failure the valve opens the Gravity Over-heat Dump Loop and fluid is allowed to convectively circulate through this loop.

Overheat loop: with electricity

The Honeywell L4008B aquastat provided with the boiler is wired in parallel with the thermostat on the zone with the most heating capacity in the main living area. Upon reaching the aquastat set point (200 °F) the heating zone will be activated, pulling heat away from the boiler. The home owner is alerted to a potential problem with the boiler by an overly warm living space.

2.5 Emergency procedure

2.5.1 In the event of loss of electrical power

- ❒ Do not open any Boiler Doors or Ash-Pit Door
- ❒ Do not load fuel into the boiler
- ❒ Push the black clutch release button on each actuator and manually close the air dampers by turning them all the way counter-clockwise (left).
- ☞ Boiler Control System automatically restarts after power fail restart
- ☞ One hour after power has returned, check system for normal operation and compare the pressure gauge reading to initial settings. If system pressure is low, replenish water to the heating system according plumber's instructions.

2.5.2 Overheating of the system

- ❒ Do not open any Boiler Doors or Ash-Pit Door!
- ❒ Turn all thermostats in your house to their highest temperature settings and open all windows.
- ❒ Open all hot water faucets.
- ❒ When boiler temperature has dropped below 180°F (82°C), reverse the above steps.
- ❒ In case Overheat Thermostat automatically has been activated please refer to chapter 2.4.1 Devices for Preventing the Boiler from overheating.

2.5.3 In the event of runaway fire

- ❒ Turn off Emergency Off Switch, if installed.
- ❒ Do not open any Boiler Doors or Ash-Pit Door!
- ☞ Do not switch off Main Switch at Boiler Control System!

In case no Emergency Off Switch is installed:

1. Open Insulation Door slightly and keep it opened
2. Push DOWN Arrow Key at Boiler Control System to switch off Induced Draft Fan
3. Keep Insulation Door opened
4. Do not open Ash-Pit Door or any Boiler Door behind Insulation Door
5. Push the black clutch release button on each actuator and manually close the air dampers by turning them all the way counter-clockwise (left).

- ☞ When there is no more risk of runaway fire, turn on Emergency Off Switch and close Insulation Door and resume to normal operation of the system.

2.5.4 Strong Smell of flue gas

⚠ DANGER

Flue gases can cause fatal poisoning!

When there is strong smell of flue gas:

- ❒ Keep all the doors on the boiler closed
- ❒ Air the room where the boiler is installed
- ❒ Close the fire protection door and doors to living areas

3 Operating the system

3.1 General information

☞ IMPORTANT: First start up of boiler system shall be carried out only in attendance of an authorized installer or manufacturer's representative

The individual steps for first startup are explained in the installation manual

⚠ WARNING

During normal operation of boiler all surfaces and control handles behind insulation door get hot. Touching hot surfaces can cause serious burns! Additionally there is the risk of injuries by splinters of fire wood!

When heating up or refueling the boiler:

- ❒ Always wear protective gloves
- ❒ Always use control handles for open boiler doors

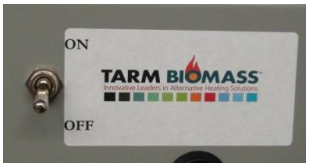
3.1.1 Preparing fire wood

Prepare the necessary amount of fuel within boiler area before opening boiler doors. For usability and preparation of fire wood; pay attention to chapter 2.2 within this manual.

For details refer to chapter 2.2.1 Permitted fuel

3.1.2 Main Switch at Boiler Control System

- ❒ Check the Main Switch at the right hand side of the boiler



⚠ WARNING

Switching off the Main Switch when boiler is hot will cause explosive gases!

☞ Avoid switching off Main Switch at Boiler Control System during heating season!

☞ In case Main Switch was switched off switch it on and wait for at least 15 minutes before continuing!

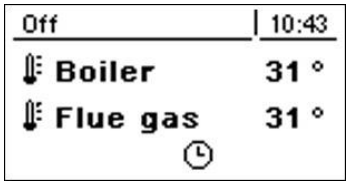
3.1.3 Error status of Boiler Control System

- ❒ Check the Status LED at Boiler Control Display unit for activated and error free system (green flashing light)
  - ➥ In case any error message is displayed at Boiler Control System (red flashing light at Status LED) or display is blank refer to chapter 6 "Troubleshooting"

⚠ CAUTION

Do not open any Boiler Door before error is cleared!
Refrain from fueling!

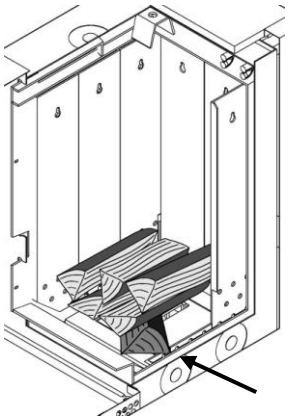
3.1.4 Operation status of Boiler Control System



- ❒ Check Graphic Display at Boiler Control System for actual operating mode
  - ➥ If operating mode is "Off" procedure 3.3, "Heat up the boiler" has to be carried out
  - ➥ "Refueling" usually takes place at the end of operating mode "Heating". Refer to 3.4 Refueling the boiler
  - ➥ For behavior in all other operating modes please refer to 4.1.3 Operating modes

3.1.5 Starting the boiler for the first time

- ❒ Put one log diagonal into the Fuel Loading Chamber
- ❒ Put a first layer of log wood at the diagonal log



- ❒ Cover these log wood with pieces of uncoated paperboard
- ❒ Add one additional layer of logs into the Fuel Loading Chamber

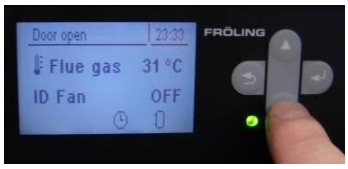
- ❒ Close Filling Chamber Door

3.1.6 Ignition

❒ Open Ignition Door and add some newspaper

❒ Ensure Basic Display is shown at Boiler Control System, e.g. keeping Back key pushed longer than four seconds.

➲ For details refer to chapter 4.1.2 Graphical Display



❒ Turn off the Induced Draft Fan by pressing DOWN arrow key

❒ Light up the newspaper

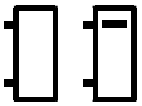
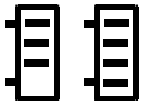
❒ Turn on the Induced Draft Fan again by pressing UP arrow key

❒ Keep Ignition Door ajar and Insulation Door open during the whole combustion process. Step aside from boiler doors and watch boiler during the whole procedure.

☞ Never leave boiler unattended before Ignition combustion is finished.

3.2 When do you need to heat up or refuel your boiler

❒ Check the Thermal Storage loading status symbol at the display unit to see how much energy you have in your Thermal Storage System

Loading Status	Description
	No dash or one dash visible in loading status symbol: ❒ You can fill up the Fuel Loading Chamber completely and set fire.
	Two dashes visible in loading status symbol: ❒ Only fill half the Fuel Loading Chamber.
	Three or four dashes in loading status symbol: ☞ Do not heat up or recharge the boiler! The Thermal Storage System is still too hot to store additional amount of energy

3.2.1 Inspect the burning flame

Because opening the Combustion Chamber Door during heating is dangerous and destructive to the boiler, there is not a possibility to watch the burning flame by means other than the ash door viewing window:

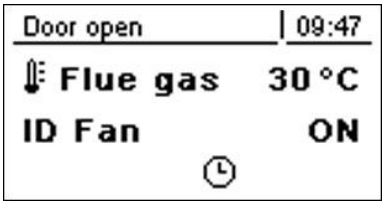
❒ Open the Insulation Door
☞ Do not open any other Boiler Door!

❒ Cautiously turn rotary slide cover at Combustion Chamber Door to get sight glass into visible position
❒ Watch Combustion Chamber through sight glass
❒ Cautiously turn rotary slide cover at Combustion Chamber Door back to get sight glass into covered position and close Insulation Door again

3.3 Heat up the boiler

3.3.1 Prepare for Fueling

- ❒ Open Insulation Door
  - ➥ Operating mode "Door open" will be shown at the Graphic Display of Boiler Control System
  - ➥ The Induced Draft Fan must start automatically - you will hear the noise



- ❒ Cautiously open Fuel Loading Chamber Door, keeping face away from opening

- ❒ Check the amount of combustion residues within the Filling chamber
  - ➥ If level of ashes is not too high (i.e. you can see both upper rows of air holes within the Cladding Plates), continue with fueling
  - ➥ If level of ashes is too high, refer to chapter 5.2.2 "Weekly Maintenance" and remove the ashes before fueling

- ❒ Check for combustion residues within the Flame Slot and remove all of them

3.3.2 Fueling the boiler

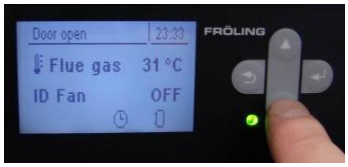
- ❒ Put a first layer of wood into the Fuel Loading Chamber directly on the combustion residues on upper surface of Combustion Chamber.
- ☞ Keep the Flame Slot uncovered!
- ❒ Cover these log wood with pieces of uncoated paperboard

- ❒ Fill up the Fuel Loading Chamber with the desired amount of fuel in accordance to heat demand (shown by Thermal Storage System loading status symbol as described above)
- ❒ Close Fuel Loading Chamber Door

3.3.3 Ignition

- ❒ Cautiously open Ignition Door
- ❒ Add some newspaper in front of the wood

- ❒ Ensure Basic Display is shown at Boiler Control System, e.g. keeping Back key pushed longer than four seconds.
  ➲ For details refer to chapter 4.1.2 Graphical Display



- ❒ Turn off the Induced Draft Fan by pressing DOWN arrow key

❒ Light up the newspaper

❒ Turn on the Induced Draft Fan again by pressing UP arrow key

❒ Keep Ignition Door ajar.

❒ Step aside from boiler doors and watch boiler until flue gas temperature displayed exceeds 130°C (270°F).

☞ Never leave boiler unattended before Ignition procedure is successfully finished

⚠ CAUTION

In case of strong smell of smolder or fume coming out of the Ignition Door close Ignition Door and Insulation Door immediately and follow Caution instructions "Explosive Gases!" at Caution Labels

In case flue gas temperature does not exceed 130°C (270°F) within 15 minutes:

❒ Close both Ignition Door and Insulation Door

In case any error message is displayed at Boiler Control System or display is blank:

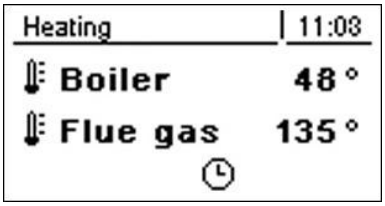
➲ Refer to chapter 6 "Troubleshooting"

☞ If necessary cautiously repeat Ignition procedure

❒ Close Ignition Door

❒ Close Insulation Door

➥ Boiler Control shall be in "Heating" or "Heating up" mode

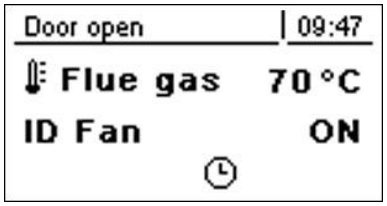


3.4 Refueling the boiler

3.4.1 Prepare for Fueling

☞ Before opening Insulation Door actual operating mode is “Heating”!

❒ Open Insulation Door
  ➥ Operating mode "Door open" will be shown at the Graphic Display of Boiler Control System
  ➥ The Induced Draft Fan must start automatically - you will hear the noise



❒ Cautiously Open Fuel Loading Chamber Door, keeping face away from opening

❒ Check the amount of un-burnt fuel within the Filling chamber and decide for refueling in accordance to heat demand (shown by Thermal Storage System loading status symbol as described above)

3.4.2 Fueling the boiler

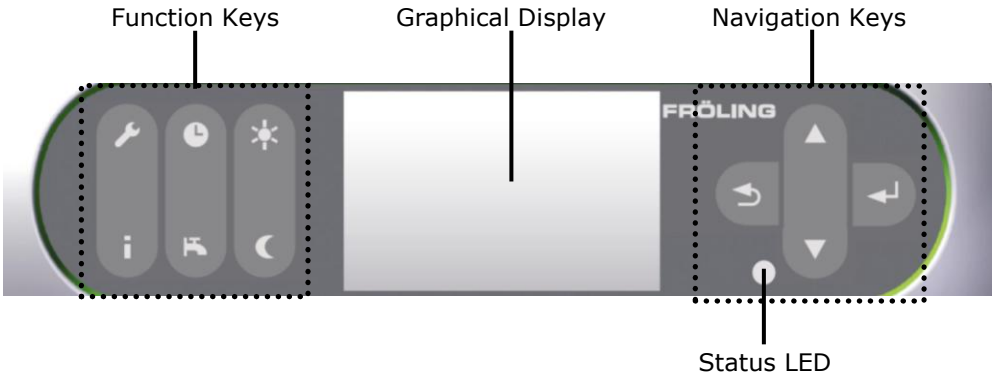
❒ Fill up the Fuel Loading Chamber with the desired amount of fuel in accordance to heat demand (shown by Thermal Storage System loading status symbol as described above)
❒ Close Fuel Loading Chamber Door

4 Boiler Control System Lambdatronic S 3200

This chapter contains information about use, control parameters, troubleshooting and the electrical connections of the Boiler Control System Lambdatronic S 3200. All parameters, which are visible at the service technician operator level, are shown.
The parameters at Owner's level are shown with a grey background!

4.1 Overview of the Basic Functions

4.1.1 Control keys and Display



Navigation Keys

The navigation keys are for scrolling in the menu and changing parameter values

Key	Function for ..
UP arrow	Navigation: Move up in the menu
	Parameter change: Short keystroke: Increase value Long keystroke: Increase value in steps of 10 Long keystroke (> 10 sec): Increase value in steps of 100
DOWN arrow	Navigation: Move down in the menu
	Parameter change: Short keystroke: Decrease value Long keystroke: Decrease value in steps of 10 Long keystroke (> 10 sec): Decrease value in steps of 100
Enter key	Navigation: Go to selected menu
	Parameter change: Short keystroke: Unlock parameter for editing or save parameter value
Back key	Navigation: Go back to higher menu
	Parameter change: Short keystroke: Do not save parameter value Long keystroke: Back to Basic Display without saving

Status LED

The status LED shows the operating status of the system:

- green light flashing slowly: boiler activated
- green light flashing quickly: boiler deactivated
- red light flashing: error

Function Keys

It should always be noted that most function keys of the Lambdatronic have dual functions. Different functions can be called with long or short keystrokes, using the following definitions of keystroke duration:

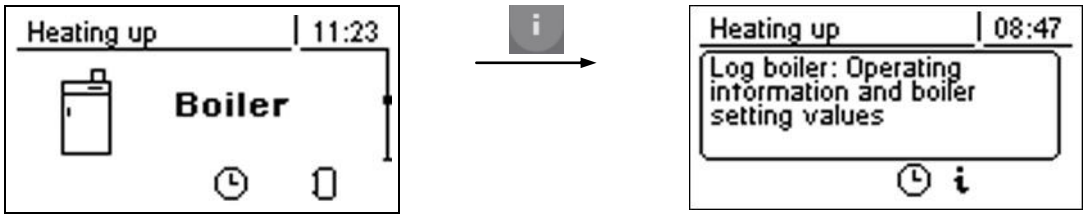
Short keystroke ..... < 1 sec
Long keystroke ..... > 4 sec

Keystroke		Function / Symbol in status line		
Service Program	Short	Chimney sweep	System is operated for 30 minutes with rated load To exit this function: Use "Automatic Program" below	
	Long	Service operation	Function not used	
Automatic Program	Short	Automatic (On)	Function not used (exit other functions only)	
	Long	Off	Function not used	
Party Program	Short	Party operation	Function not used	
	Long	Extra heating	Function not used	
Info	Short	Display info text	Query / Information text on menu points or errors To exit this function: Use "Back key" above	
	Long	No function		
DHW tank-Program	Short	Extra loading	Function not used	
	Long	Summer operation	Function not used	
Drawdown Program	Short	Drawdown	Function not used	
	Long	Continuous draw-down	Function not used	

Info Key

The info key can be pressed at any time and always shows a text window, with information about the current menu point or the currently pending error. Error messages always have the highest priority.

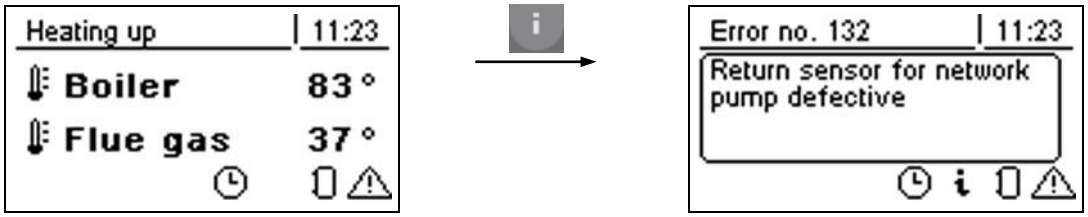
Info key in normal operation:



In normal operation (without error messages) the info key can be pressed to display information or an explanation for every menu point or parameter.

The info text is also identified by the frame and the info symbol in the status line.

Info key for pending error messages:



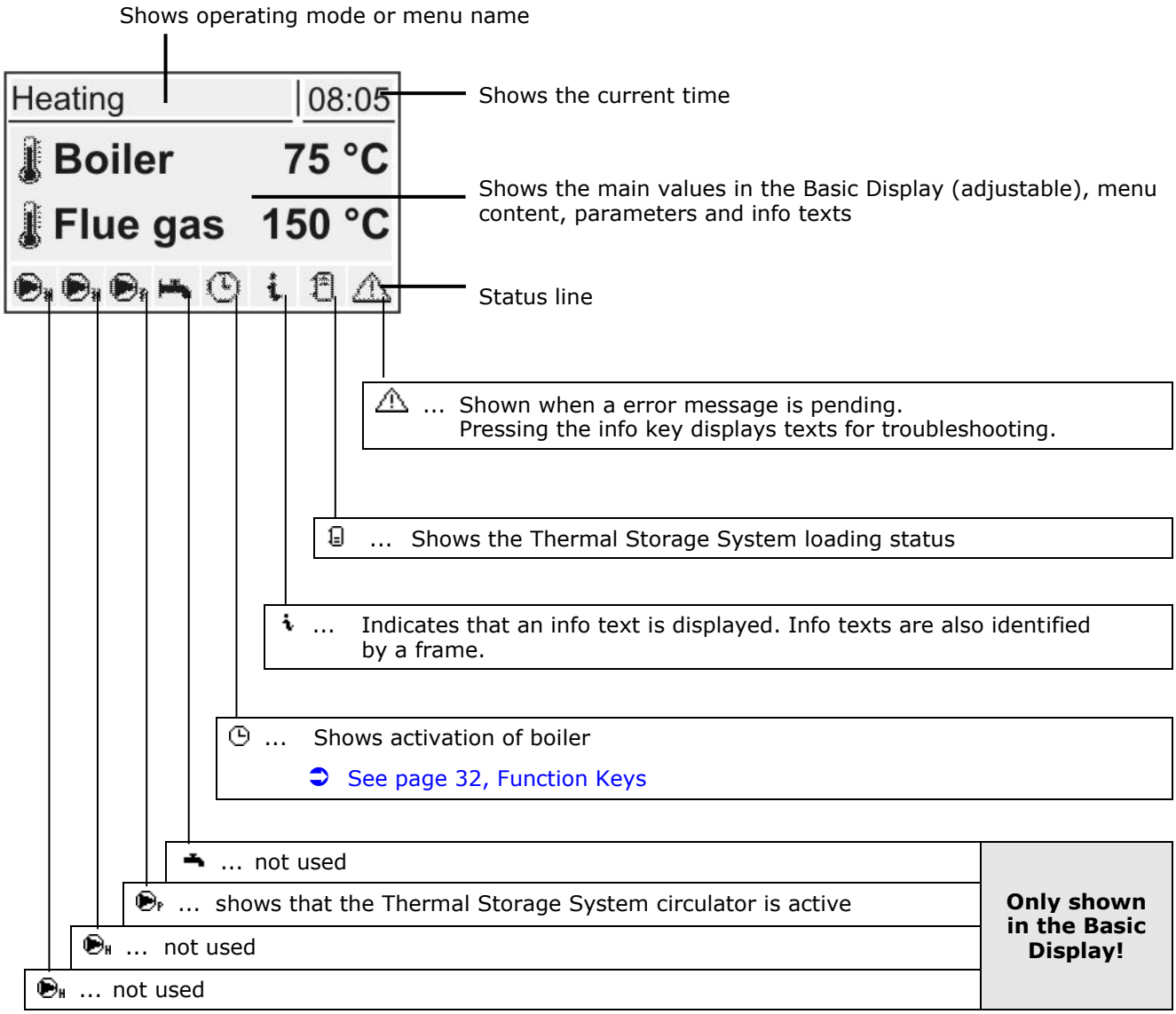
If an error message was acknowledged after arising, but not resolved, this is displayed by an error symbol at the bottom right on the status line.

Pressing the info key calls up the information on the currently pending error message again.

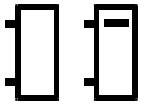
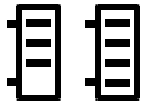
How to proceed when troubleshooting an error message:

➲ See 6.3 Error messages

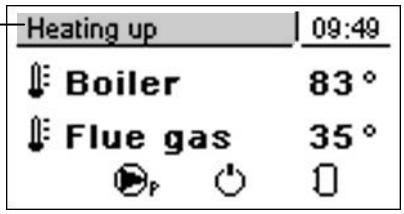
4.1.2 Graphical Display


Shows operating mode or menu name
Heating
08:05
Shows the current time
Boiler
75 °C
Flue gas
150 °C
Shows the main values in the Basic Display (adjustable), menu content, parameters and info texts
Status line
... Shown when a error message is pending. Pressing the info key displays texts for troubleshooting.
... Shows the Thermal Storage System loading status
... Indicates that an info text is displayed. Info texts are also identified by a frame.
... Shows activation of boiler
See page 32, Function Keys
... not used
... shows that the Thermal Storage System circulator is active
... not used
... not used
Only shown in the Basic Display!

Thermal Storage System loading status

Loading Status	Description
	No dash ore one dash visible in loading status symbol: ❒ You can fill up the Fuel Loading Chamber completely and set fire.
	Two dashes visible in loading status symbol: ❒ Only fill half the Fuel Loading Chamber.
	Three or four dashes in loading status symbol: ☞ Do not heat up or recharge the boiler! The Thermal Storage System is still too hot to store additional amount of energy

4.1.3 Operating modes

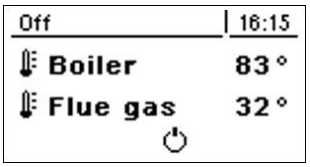


Heating up	Mode of Boiler Control System during the heating process up to a certain minimum flue gas temperature. Induced Draft Fan and primary air at 100%. In case more fuel is required, wait for operating mode "Heating" or "Off"
Heating	The Boiler Control System controls combustion according to the boiler set points. If refueling required refer to 3.4 Refueling the boiler
Slumber	Very low heat consumption. When the set point of boiler temperature is exceeded by a specified value, the Boiler Control System switches to "Slumber" mode. The Induced Draft Fan stops, the air dampers are closed to the minimum opening. If the temperature falls below the set point of boiler temperature the Boiler Control System returns to "Heating" mode". Do not open Boiler Doors! Do not refill fuel!
Door open	The Insulation Door is open, the Induced Draft Fan runs at maximum speed. On closing Insulation Door properly the operating mode has to change to "Heating up" mode. Follow instructions mentioned there. If operating mode does not change to "Heating up" refer to 6.4 Misoperation of Door Switch
Off	The fuel wood loaded is burnt down to residual embers. If operating mode is "Off" a "Cold Start" procedure (fueling and ignition) has to be carried out. Please refer to 3.3 Heat up the boiler
Fault	Alarm: Combustion was stopped by overheat thermostat (safety temperature limiter - STL)! Error message pending! Do not open Boiler Doors! Do not refill fuel! For procedure for error messages refer to 6.3 Error messages at Boiler Control System

4.2 Initial start-up

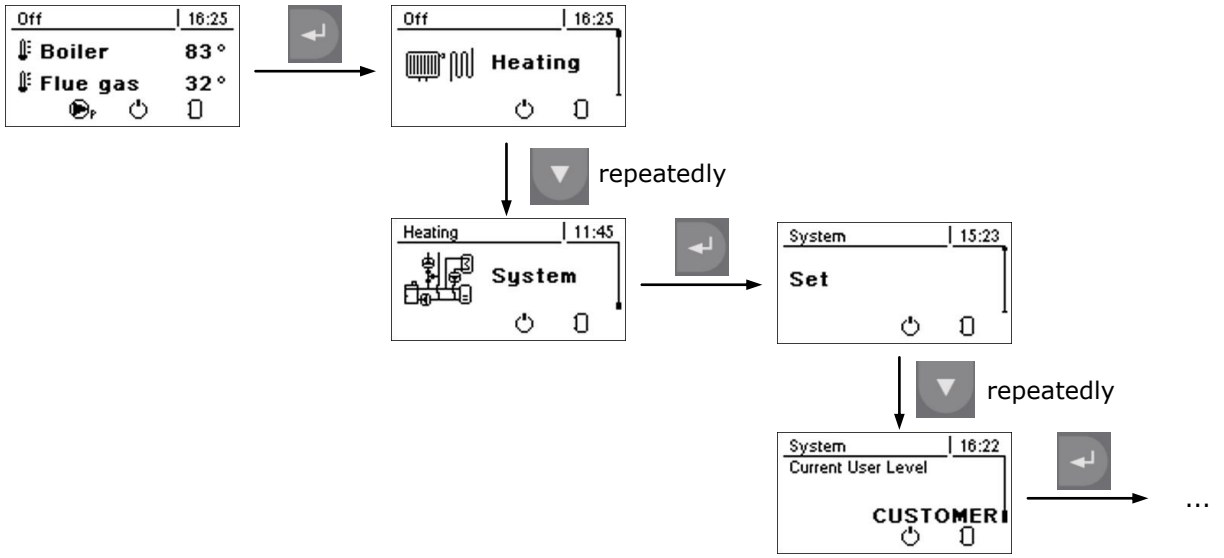
After power up the start logo is displayed. The Boiler Control System performs a system check.

After the system check the Basic Display is shown. The Basic Display is shown as default during normal operation, giving information about the two most important parameters; the display can be configured individually.



4.2.1 Changing the User Level

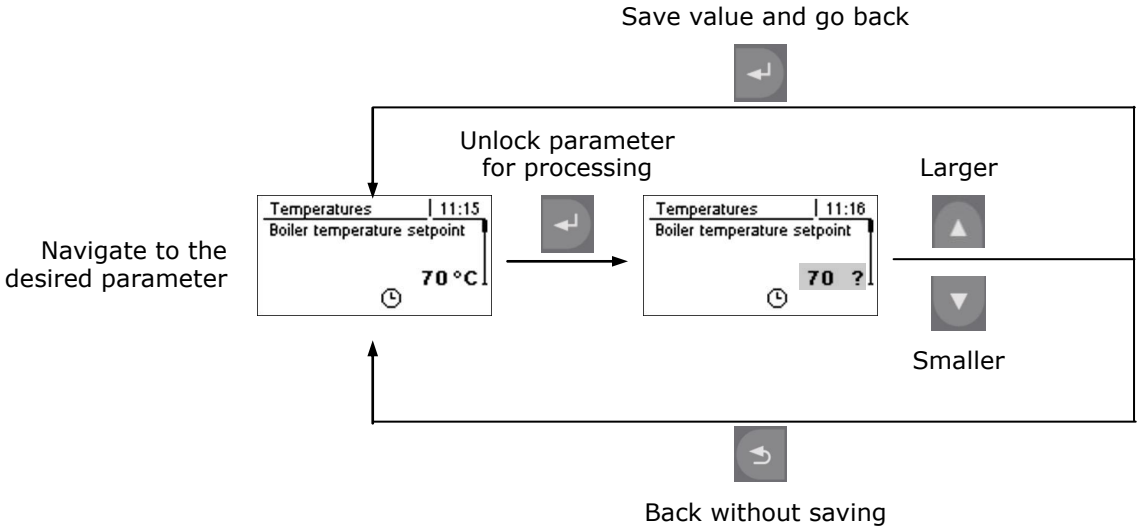
For safety reasons certain parameters are only visible at specific User Levels. To change to another level it is necessary to enter the relevant user code:



Child lock (User Code 0)	At "Child lock" level, only the Basic Display is shown. It is not possible to change any parameter at this level.
Owner (User Code 1)	Standard level for normal operation of controls. All parameters for Owner's use are displayed and released for adjustment.
Installer / Service	Detailed level for Installation and Service purposes. All parameters and system controls available are displayed and released for adjustment. All parameters shown in these operating instructions are available.

4.3 Setting parameters

Changing values is very simple and is identical for all parameters:



☞ All parameter values are pre-set to allow optimal operation in a wide range of application without any need of further changes to the parameter.

The following parameters, however, can/should be set as desired by the Owner:
- Desired target boiler temperature

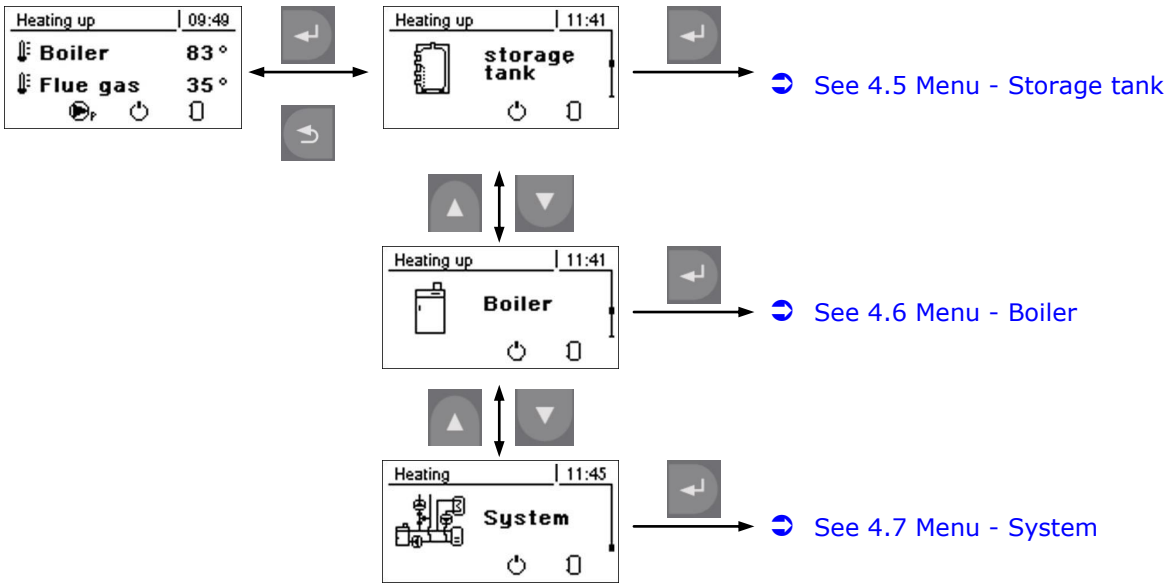
☞ All temperature values at Boiler Control System are displayed in Centigrade or °C only!

☞ Temperature values in Fahrenheit or °F can be estimated using the following conversion table, based on:
°F = 1.8 x °C + 32 °C = (°F - 32) / 1.8

°C	°F	°C	°F
0	32	65	149
5	41	70	158
10	50	75	167
15	59	80	176
20	68	85	185
25	77	90	194
30	86	95	203
35	95	100	212
40	104	105	221
45	113	110	230
50	122	115	239
55	131	120	248
60	140	125	257

°F	°C	°F	°C
32	0	160	71
40	4	170	77
50	10	175	79
60	16	180	82
70	21	185	85
80	27	190	88
90	32	200	93
100	38	210	99
110	43	220	104
120	49	230	110
130	54	240	116
140	60	250	121
150	66	255	124

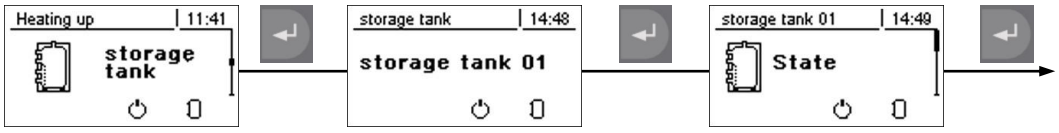
4.4 Menu Overview



➲ See 4.5 Menu - Storage tank
➲ See 4.6 Menu - Boiler
➲ See 4.7 Menu - System

4.5 Menu - Storage tank

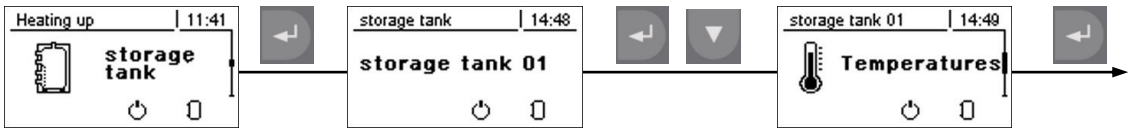
4.5.1 Status display of the Thermal Storage System



Storage tank
01 ... 08

Display	Description
Storage tank top temperature 55°C	Current temperature at Thermal Storage System top sensor.
Storage tank bottom temperature 50°C	Current temperature at Thermal Storage System bottom sensor.
Storage tank pump control 0%	Function not used! Pump control either 0% or 100% speed! Specifies the speed of the Thermal Storage System circulator as a percentage of maximum speed.

4.5.2 Temperature settings for Thermal Storage System

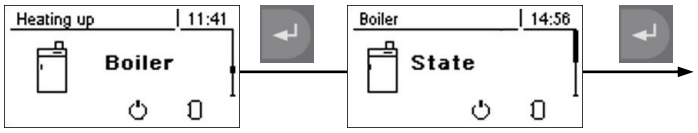


Storage Tank
01 ... 08

Setting value	Description
Heating circuit release from following storage tank temperature 35°C	Function not used! Minimum value for heating circuit release for combination with a Thermal Storage System.

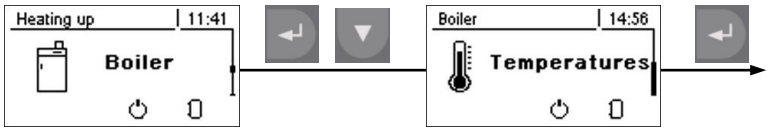
4.6 Menu - Boiler

4.6.1 Status Displays for the Boiler



Display	Description
Boiler temperature 80°C	Actual state values of boiler control system : :
Flue gas temperature 167°C	
ID fan - control 90%	
Primary air 97%	
Secondary air 36%	

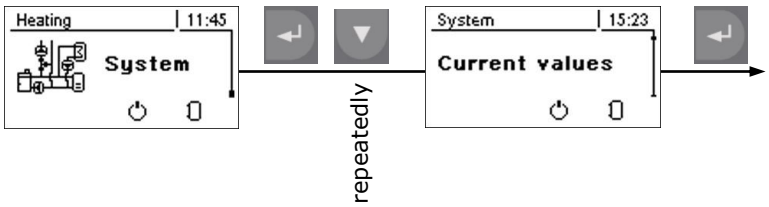
4.6.2 Temperature settings for the Boiler



Setting value	Description
Boiler temperature setpoint 80°C	Major set point for Boiler Control System. The boiler temperature is continuously controlled to reach and hold this temperature

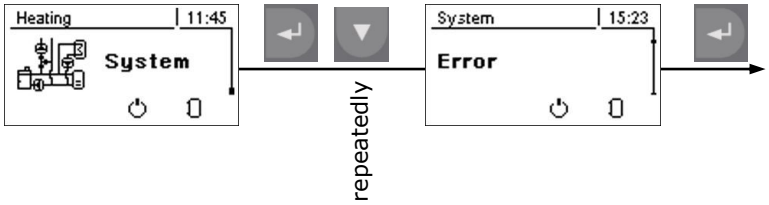
4.7 Menu - System

4.7.1 Current values



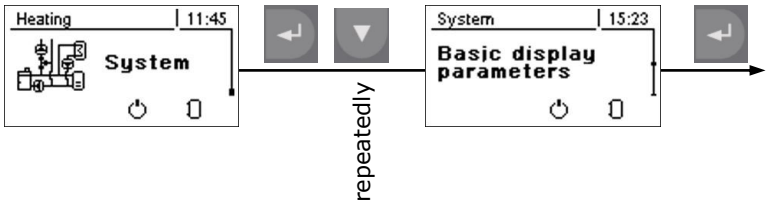
Parameter		Description
Boiler temperature	**80°C**	Display of the current state values for boiler control system : :
Flue gas temperature	**167°C**	
ID fan - control	**90%**	
Primary air	**97%**	
Residual oxygen content	**8.0%**	
Secondary air	**36%**	
Service hours	**23h**	
Service hours in slumber mode	**2.1h**	
Software version	**Version: 50.04 Build: 04.12**	

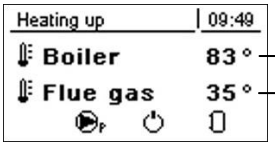
4.7.2 Error



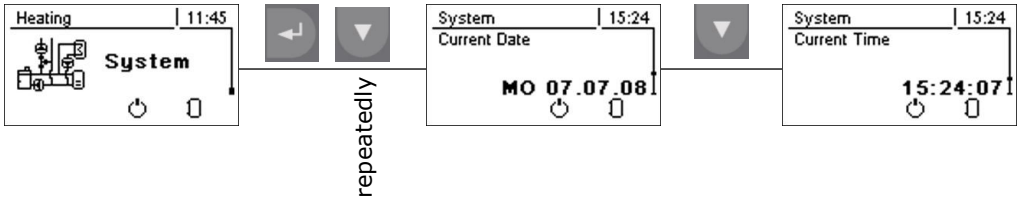
➲ See 6.3 Error messages at Boiler Control System

4.7.3 Basic Display parameters



Basic Display		Description
	**Position 1** **Position 2**	The display of the two values in positions 1 and 2 within the Basic Display can be adjusted individually, and for each position you can choose from the following parameters: *Boiler temperature, flue gas temperature, Thermal Storage System top temperature, Thermal Storage System bottom temperature, Thermal Storage System graphic, residual Oxygen, Induced Draft Fan*

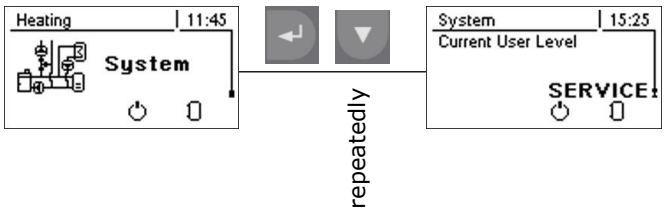
4.7.4 Time settings



In American configuration Date and Time are used for display purposes only!
Format of Calendar Date:
Weekday (2 letters) – Day (2 digits) . Month (2 digits) . Year (2 digits)
e.g.: MO 07.07.08 = Monday 07th of July, 2008

Format of Time:
Hour (2 digits, 24-hour-clock) : Minute (2 digits) : Second (2 digits)
e.g.: 15:24:07 = 3:24 pm and 7 seconds

4.7.5 Current User Level



➲ For user Levels refer to 4.2.1 Changing the User Level

5 Boiler Maintenance

5.1 General

⚠ DANGER

Work on electrical components is very dangerous. Avoid severe personal injuries and death.

Only licensed electricians to perform electrical work!

⚠ WARNING

The boiler is hot. Flue gas pipe and hot parts can cause serious burns! Wait for the boiler to cool down before starting any maintenance work.

- ❒ Wait until operating mode "Off" is displayed at the Boiler Control System
- ❒ Wait at least another hour for the boiler to cool down before starting any maintenance work

- ❒ Always wear protective gloves
- ❒ Always use control handles for open boiler doors

⚠ WARNING

Incorrect or insufficient cleaning and maintenance of the boiler can cause serious faults in combustion (e.g. spontaneous of carbonization gases or flash fires). The instructions and information provided in this manual shall be observed.

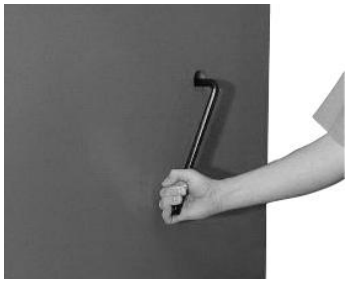
Follow instructions for cleaning and maintenance within this chapter. Any further work shall be carried out by authorized heating engineers.

5.2 Inspection, cleaning and maintenance

☞ Regular cleaning of the boiler extends product life and is a basic requirement for smooth running. So clean the boiler regularly!

5.2.1 Daily Maintenance / Before every firing

Cleaning of Heat Exchanger pipes



☞ Activate the lever of the heat exchanger cleaning system (Efficiency Optimization System EOS) several times before the heating-up process (5-10 times up and down)

5.2.2 Weekly Maintenance

Removing the ash

☞ Open the Insulation Door and the Ignition Door

☞ Using the ash scraper, scrape the ash located above the Combustion Chamber into the Combustion Chamber

☞ Open the Combustion Chamber Door

☞ Remove the ash using the rounded ash shovel

☞ Shovel the ash into the container intended to receive it

☞ Important! Leave ½”-1” of ash on the refractory and cast iron surfaces to protect them.

☞ Use a Fire-proof container with a cover!

☞ Never use a vacuum to remove ash from combustion or loading chamber. This will drastically shorten the life of the combustion stones.

☞ IMPORTANT:
Ashes removed from the boiler should be placed in a metal container with tightly fitting lid. The closed container of ashes should be placed on a non-combustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled. Other waste should not be placed in this container

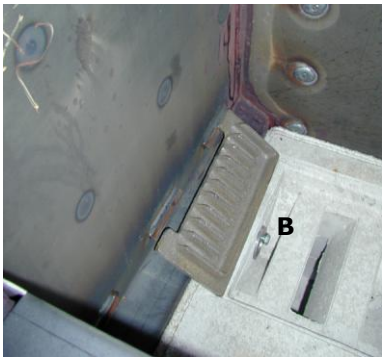
Cleaning the flue channels both sides of the Combustion Chamber

- ❒ Open the Insulation Door and Combustion Chamber Door
- ❒ Check the passage to the left and right of the Combustion Chamber for ash deposits
- ☞ The amount of ash will depend on the type of fuel used!
- ❒ Clean the passages with a small brush and remove any fallen ash

5.2.3 Monthly Maintenance

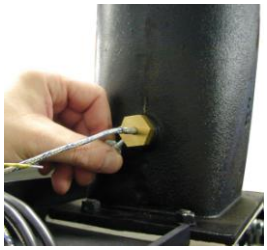
Cleaning the grate

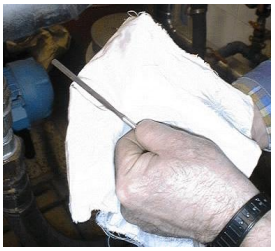
- ❒ Open the Insulation Door and Fuel Loading Chamber Door
- ❒ Remove the grate (B)
- ❒ Remove the ash deposits under the grate to ensure trouble-free flow of secondary air!
- ❒ Important! After cleaning under the grates, add ½"-1" of ash on top of refractory and cast iron surfaces to protect them.



5.2.4 Annual Maintenance

Cleaning flue gas pipe and flue gas sensor

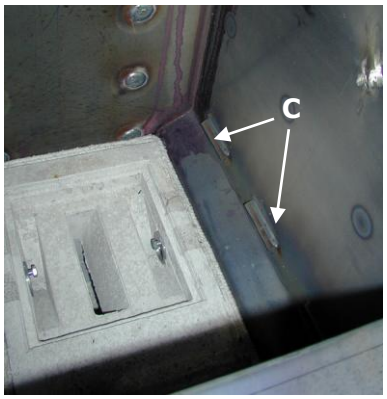




- ❒ Mark existing mounting position carefully
- ❒ Release the retaining screw and remove the sensing element from the Flue Gas Connector
- ❒ Clean the Flue Gas Pipe between the Boiler and the Chimney with a chimney sweep brush
- ❒ Wipe off the sensing element with a clean cloth
- ❒ Slide in the flue gas sensing element to the marked position and secure it gently with the retaining screw
- ❒ Clean behind the steel aprons. Focus attention on the primary air inlets.

Checking the primary air openings

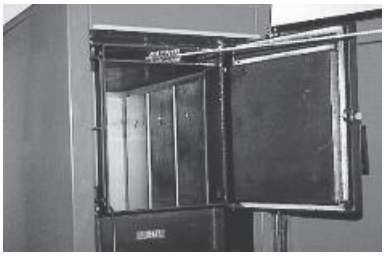
- ❒ Open the Insulation Door and Fuel Loading Chamber Door
- ❒ Unhinge the cladding plates
- ❒ Check the primary air openings (C) for unobstructed air-flow
- ❒ If necessary, clean the openings



Cleaning the Smoke Extraction Duct

- ❒ Switch off Main Switch
- ❒ Open the Insulation Door and Fuel Loading Chamber Door
- ❒ Clean the Smoke Extraction Duct with a small brush

- ☞ Combustion gases are sucked out when the Insulation Door is opened!
- ☞ Take care not to push the brush into the Induction fan!

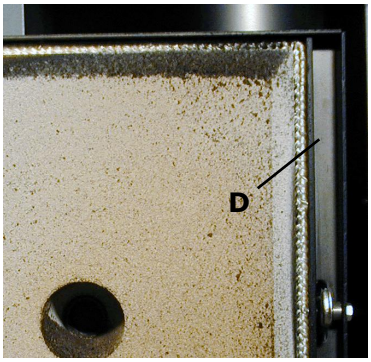


Checking the tightness of door gaskets

- ❒ Close the respective door and check its gasket
- ❒ Check gasket (D) for perfect alignment on the door frame
  - ➥ Imprint in the gasket

If the gasket is colored black at several points or the imprint is interrupted:

- ➥ The gasket is no longer efficient.
- ➥ Replace the gasket



Checking the Draft Regulator and blowback flap

- ❒ Check the Draft Regulator and blowback flap for faultless operation

6 Troubleshooting

6.1 General faults in power supply

Error indication	Cause of error	Troubleshooting
Nothing is shown on the display **No power to the controls**	General power failure Ground Fault Circuit Interrupter or line protection is switched off Main Switch is turned off Defective fuse	 Switch on the Ground Fault Circuit Interrupter or line protection Turn on the main switch Replace fuse – note amperage rating

In the event of loss of electrical Power:

- ❒ Do not open any Boiler Doors or Ash-Pit Door
- ❒ Do not load fuel into the boiler
- ☞ Boiler Control System automatically restarts after power fail restart
- ☞ One hour after power has returned, check system for normal operation and compare manometer reading to initial settings. If system pressure is below, replenish water to the heating system according plumber's instructions.

6.2 Excessive temperature

The Overheat Thermostat stops combustion at a boiler temperature of 212°F (100°C). The circulators continue to run!

In case Overheat Thermostat automatically has been activated:

- ❒ Wait for boiler temperature to drop below 170°F (77°C)
- ❒ Remove cap of Overheat Thermostat (STL) by screwing-off counter-clockwise. STL located at right hand side of Boiler Control System viewed from front side of the boiler.
- ❒ Release STL by pushing button behind cap using a small screw driver or ball point pen. Release was successfully, when fault is gone on display.
- ❒ Screw-on cap of STL again (clockwise).

6.3 Error messages at Boiler Control System

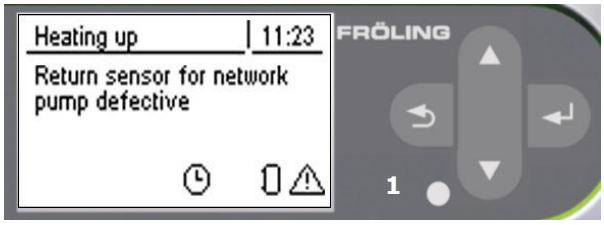
Errors shown within the Boiler Control System are classified into three different kinds:

Error notes: Error messages are shown, but there is no influence to the combustion

Errors: Error messages are shown and combustion will be stopped in a controlled way (not used in FHG boilers)

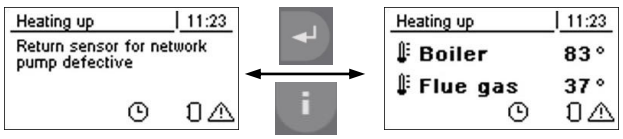
Alarms: Error messages are shown and combustion will be stopped immediately

In all kinds: Circulators, e.g. the Thermal Storage System circulator are controlled by temperatures and will continue to run usually

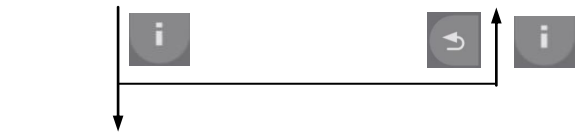


When an error is detected:

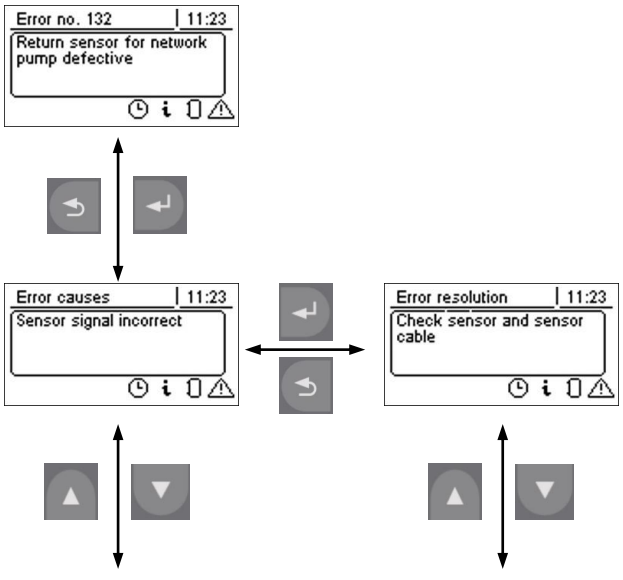
- ➥ The status LED (1) flashes red
- ➥ The error number and the relevant message text are shown in the graphic display
- ➥ The "Error symbol" is also displayed in the status line



After pressing the Enter key the error is acknowledged
The error symbol in the status line shows that the error is still pending



Pressing the info key displays the error message including the related error number.
The error symbol only switches off when the error has been resolved!



After pressing the Enter key an information text on the cause of the error is displayed. Pressing the Enter key again displays instructions for resolving the error.

If there are several causes for an error or if there are several options for resolution for one cause, you can scroll through with the navigation keys.

6.3.1 Acknowledging a error message

Trace and remove the error cause and then:

❒ Press Enter Key (6.3)

➥ Status LED flashes green

6.3.2 List of possible error message

Error number / Error message		Error information text / Cause of Error	Troubleshooting
0	Hi-limit or e-stop activated!! Overheat Thermostat (STL) or EMERGENCY OFF activated	• The boiler has overheated through strong reduction in heat consumption	❒ Overheat Thermostat automatically has been activated: Reset Overheat Thermostat (STL) after the boiler has cooled down Refer to 6.2 Excessive temperature
		• Customer switches for heating or circulators (pumps) outside Boiler Control System were switched off	❒ Check switches for heating or circulators (pumps) outside Boiler Control System
		• Circulator (pump) suddenly stops	❒ Check circulator (pump)
		• Slide valves, cut-off valves, flow-check valves or zone-valves closed	❒ Reopen slide valves or cut-offs, check flow-check valves or zone-valves
1	Boiler temperature sensor faulty	• Sensor signal incorrect	❒ Check sensor; ask a licensed electrician to check sensor cable and connections
2	Primary air damper blocked	• Deviation of more than 5% between position and control signal for more than 5 minutes	❒ Check actuator and mechanics
		• Actuator not turning	❒ Ask a licensed electrician to check actuator cable and connections
		• Actuator incorrectly fitted	❒ Correct assembly: the damper must be closed at primary air signal 0%
		• Incorrect direction of rotation	❒ Ask a licensed electrician to swap connections for "open" and "close" at plug within Boiler Control System
		• Movement of damper impeded	❒ Check to see if damper is jammed
		• Connection cable defective	❒ Ask a licensed electrician to check actuator cable and connections

Error number / Error message		Error information text / Cause of Error	Troubleshooting
3	Secondary air damper blocked	• Deviation of more than 5% between position and control signal for more than 5 minutes	❒ Check actuator and mechanics
		• Actuator not turning	❒ Ask a licensed electrician to check actuator cable and connections
		• Actuator incorrectly fitted	❒ Correct assembly: the damper must be closed at secondary air signal 0%
		• Incorrect direction of rotation	❒ Ask a licensed electrician to swap connections for "open" and "close" at plug within Boiler Control System
		• Movement of damper impeded	❒ Check to see if damper is jammed
		• Connection cable defective	❒ Ask a licensed electrician to check actuator cable and connections
4	Boiler has air leak	• Safety time limit for checking for wrong air expired: If the secondary air signal is 0% and the flue gas temperature is above 100°C this time starts to run. If it is certain that within this time the two values do not change, the error note "Boiler has air leak" will be displayed	❒ Wood in combustion chamber may have "bridged" during combustion ❒ Check gaskets at all boiler doors and covers for air leakage, ❒ Check correct assembly of lambda probe ❒ Ask your boiler dealer for maintenance
25	EMERGENCY OFF switch was activated	• Emergency Off Switch was activated	❒ Follow emergency procedure "In the event of runaway fire" ❒ If emergency conditions are cleared turn on EMERGENCY OFF switch again
		• In case no Emergency Off Switch is installed connection plugs shall be looped	❒ Ask a licensed electrician to loop connection plugs for Emergency Off Switch within Boiler Control System
58	Bus module faulty before power switched off	• A module connected to the bus system dropped out or was disconnected	❒ Reconnect module to the bus system
		• Interruption at bus cable hardware - no data transfer or control power supply	❒ Ask a licensed electrician to check bus cable, plug and connections
		• Electronic component malfunction at connected module	❒ Ask your boiler dealer to check and replace connected module
59	ID fan does not rotate, in spite of full activation	• Safety time limit for checking speed of induced draft fan expired • No confirmation (approx. 2min) from ID fan speed sensor	❒ Ask a licensed electrician to check plug connection and connection cable of the ID fan, as well as the position of the speed sensor ❒ Ask your boiler dealer to check and replace induced draft fan
63	001 EEPROM Read error	• Read or write function of the EEPROM memory does not work	❒ Ask your boiler dealer to check boiler control core module
64	002 EEPROM Zero checksum	• All system and parameter settings are reset to manufacturer's standard settings	❒ Set system configuration and Owner's parameters again! ❒ Error automatically cancelled after acknowledge

Error number / Error message		Error information text / Cause of Error	Troubleshooting
65	003 EEPROM Read error	• Read or write function of the EEPROM memory does not work	❒ Ask your boiler dealer to check boiler control core module
66	004 EEPROM Incorrect software version	• Incorrect software was imported. (old version)	❒ Ask your boiler dealer to install new software version
67	005 EEPROM Incorrect parameter length	• All system and parameter settings are reset to manufacturer's standard settings	❒ Set system configuration and owner's parameters again! ❒ Error automatically cancelled after acknowledge
68	006 EEPROM Read error	• Read or write function of the EEPROM memory does not work	❒ Ask your boiler dealer to check boiler control core module (hard failure)
69	007 EEPROM Incorrect checksum	• Read or write function of the EEPROM memory does not work	❒ Ask your boiler dealer to check boiler control core module (hard failure)
70	008 EEPROM Write error	• Read or write function of the EEPROM memory does not work	❒ Ask your boiler dealer to check boiler control core module (hard failure)
71	009 EEPROM Write error	• Read or write function of the EEPROM memory does not work	❒ Ask your boiler dealer to check boiler control core module (hard failure)
72	010 Config. List faulty	• Read or write function of the EEPROM memory does not work	❒ Ask your boiler dealer to check boiler control core module (hard failure)
88	Top sensor in storage tank 1 faulty	• Sensor signal incorrect • Doubtful signal at thermal storage system top sensor	❒ Check sensor ❒ Ask a licensed electrician to check sensor cable and connections
96	Bottom sensor in storage tank 1 faulty	• Sensor signal incorrect • Doubtful signal at thermal storage system bottom sensor	❒ Check sensor ❒ Ask a licensed electrician to check sensor cable and connections

6.4 Misoperation of Door Switch

If operating mode "Door open" does not change to "Heating up" mode when closing Insulation Door properly:

Ask your boiler dealer or licensed electrician to check and maintain the Door Switch! Emergency operation in the meantime is possible. Use small amounts of fuel only and pay special attention to the temperatures within Thermal Storage System.

7 Appendix

7.1 Warranty Fröling FHG Wood Boiler

LIMITED WARRANTY - FOR USE ONLY IN UNITED STATES

Tarm Biomass warrants the steel boiler identified below and its component hot water tank or coil and cast iron doors and ceramic refractory against defects in material and workmanship under normal use and service ***TO THE ORIGINAL PURCHASER AT THE ORIGINAL INSTALLATION SITE*** in the United States under the following terms.

WARRANTY IS VOID if the boiler is installed without adequate thermal storage.

BOILER BODY -- LIMITED 20 YEAR WARRANTY: Subject to the below limitations, Tarm Biomass warrants the steel boiler body (not including cast iron doors, coil, or other components) against defects in materials or workmanship causing breaks or leaks that significantly impair the boiler's performance. During the first five years of the warranty period Tarm Biomass will pay for all required labor at the usual and customary rate paid by Tarm Biomass for similar labor performed in Lyme, NH, and provide or pay the cost of all materials for the repair of the warranted unit. In years six through twenty Tarm Biomass will pay the below stated percentage multiplied by the retail price of the warranted unit on the date of purchase to the original purchaser toward the cost of repair of the warranted item or, if Tarm Biomass and the original purchaser agree, use the resultant sum as a partial allowance toward Tarm Biomass' replacement of the warranted item. The original purchaser shall be responsible for all shipping and installation charges in connection with any replacement or repair.

A year for the puposes of this warranty is defined as either 365 calender days or 3000 service hours, whichever is less.

Warranty Year (beginning from date of purchase)	Percentage Tarm Biomass will pay
1-5	100%
6	60%
7	50%
8	40%
9	30%
10-20	20%

Example 1: Repair costing $250.00 in year 7, Tarm Biomass will pay $125.00 (50% of this repair).

Example 2: Boiler (original retail $4,000.00) needs major repair in year 9. Tarm Biomass will pay $1,200 (30% of $4,000) toward replacement with similar warranted unit or up to 30% of the repair cost ($1,200 maximum).

OTHER COMPONENTS -- LIMITED THREE YEAR WARRANTY

Subject to the application of the following percentages to parts and/or labor, Tarm Biomass provides the following limited warranty of each of its boiler's cast iron doors, hot water coil, refractory and combustion chambers against defects in materials or workmanship causing breaks or leaks that significantly impair the boiler's performance.

Warranty Year (beginning from date of purchase)	Percentage Tarm Biomass will pay
1	100% of parts and labor
2	100% of parts ONLY
3	50% of parts ONLY

OTHER COMPONENTS -- ONE YEAR WARRANTY

Motors, electronic controls and other electrical components have a one year warranty.

TARM BIOMASS' LIMITED EXPRESS WARRANTY IS ONLY EXTENDED TO AND COVERS THE TARM USA PRODUCT'S END USER WHO OWNS THE BUILDING IN WHICH THE TARM USA PRODUCT IS INSTALLED, AND COVERS ONLY REPAIRS OR REPLACEMENTS RESULTING FROM DEFECTS IN MATERIALS AND WORKMANSHIP.THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE DESCRIPTION IN THIS LIMITED WARRANTY, AND TLIMITED WARRANTY IS IN LIEU OF AND TO THE EXCEPTION OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY OR WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE. EXCEPT AS OTHERWISE PROVIDED BY THIS LIMITED WARRANTY, TARM BIOMASS TAKES NO RESPONSIBILITY FOR THE QUALITY OF TARM BIOMASS PRODUCTS OR THAT THE GOODS WILL BE FIT FOR ANY PARTICULAR PURPOSE FOR WHICH YOU MAY BE BUYING THESE GOODS. UNDER NO CIRCUMSTANCES SHALL TARM USA BE SUBJECT TO INCIDENTAL, CONSEQUENTIAL, INDIRECT, SPECIAL, PUNITIVE, ENHANCED COMPENSATORY, OR CONTINGENT DAMAGES, WHETHER A CLAIM IS BASED ON CONTRACT, TORT, STRICT LIABILITY, OR ANY OTHER THEORY OF LAW, ALL SUCH DAMAGES AND CLAIMS BEING SPECIFICALLY DISCLAIMED.

Tarm Biomass' limited warranty is void if a Tarm Biomass product is installed by someone other than a qualified contractor whose principal occupation is the sale or installation of plumbing and heating equipment, or if the original purchaser fails to have the boiler serviced or inspected at least once every two years by an experienced and qualified service person. Repairs or replacements under this limited warranty must be performed by your dealer or someone authorized by him. You may be required to present this limited warranty to the dealer before any work is performed. You must pay for any work performed that is not covered by this limited warranty or that is not authorized by the dealer. Tarm Biomass' limited warranty shall be construed under the laws of New Hampshire. Any dispute arising out of this warranty shall be tried only in a court in the State of New Hampshire, including the United States District Court for the State of New Hampshire. If any legal action is brought in connection with this limited warranty, the prevailing party shall be entitled to recover all reasonable expenses it incurs in the action, including its reasonable attorneys' fees, from the nonprevailing party.

TARM USA'S LIMITED WARRANTY EXPRESSLY EXCLUDES COVERAGE FOR THE FOLLOWING:

1. Ordinary wear and tear and repairs or replacements necessitated by normal use.
2. Repairs or replacements arising from corrosion including, but not limited to, the effects of a corrosive water supply or corrosive by-products of combustion formed when a boiler is run during warm weather temperatures or under other conditions that do not permit the boiler to reach necessary operating temperatures on a frequent basis as described in the Owner's Manual provided by Tarm Biomass.
3. Repairs or replacements of fittings, motors, fuel units, oil and gas burners, any and all controls, relief or regulating valves, transformers, and accessories.
4. Repairs or replacements to repair damage caused by (i) operation with inadequate draft, (ii) having installed a boiler model that is incorrectly sized for the application (too few or too many BTU's under normal operating conditions) or that is otherwise inappropriate for the application, (iii) excessive boiler internal temperature from burning improper materials as fuel or operating the boiler without appropriate draft control (for example, burning the boiler too hot when the boiler is coming up to temperature from a cold start), or (iv) any similar use that violates or is not recommended in the Owner's Manual provided by Tarm Biomass.
5. The repair or replacement of any component furnished by any other manufacturer or damage caused by the functioning or malfunctioning of any such component.

This warranty gives you specific legal rights. You may also have other rights that vary from state to state. This warranty shall not be construed as inconsistent with any federal, state, or municipal law, regulation, or code that was applicable to the original installation site on the date the Tarm Biomass product was installed.

Questions regarding this warranty may be referred to:
Tarm Biomass, 4 Britton Lane, Box 285, Lyme, NH 03768 U.S.A. (603) 795-9100

KEEP THIS INFORMATION FOR YOUR RECORDS:

Model: _____ **Place of Purchase:** _____

Serial Number: _____ **InstallationDate:**_____

Installer_____

7.2 Temperature conversion table

°C	°F	°C	°F	°C	°F	°C	°F
40	104	80	176	135	275	220	428
45	113	82	179.6	140	284	225	437
50	122	84	183.2	145	293	230	446
52	125.6	86	186.8	150	302	235	455
54	129.2	88	190.4	155	311	240	464
56	132.8	90	194	160	320	245	473
58	136.4	92	197.6	165	329	250	482
60	140	94	201.2	170	338	255	491
62	143.6	96	204.8	175	347	260	500
64	147.2	98	208.4	180	356	265	509
66	150.8	100	212	185	365	270	518
68	154.4	105	221	190	274	275	527
70	158	110	230	195	383	280	537
72	161.6	115	239	200	392	285	545
74	165.2	120	248	205	401	290	554
76	168.8	125	257	210	410	295	563
78	172.4	130	266	215	419	300	572

7.3 Manufacturer

FROLING GmbH

Industriestraße 12
A-4710 Grieskirchen
AUSTRIA

PHONE 0043 (0)7248 606 0
E-MAIL info@froling.com
INTERNET www.froeling.com

7.4 Importer

Tarm Biomass

4 Britton Lane
P.O. Box 285
Lyme, NH 03768

PHONE 800.782.9927
E-MAIL info@tarmbiomass.com
INTERNET www.tarmbiomass.com

7.5 Local Dealer